Captive breeding of the critically endangered European weatherfish: A refuge for conservation-sensitive parasites?

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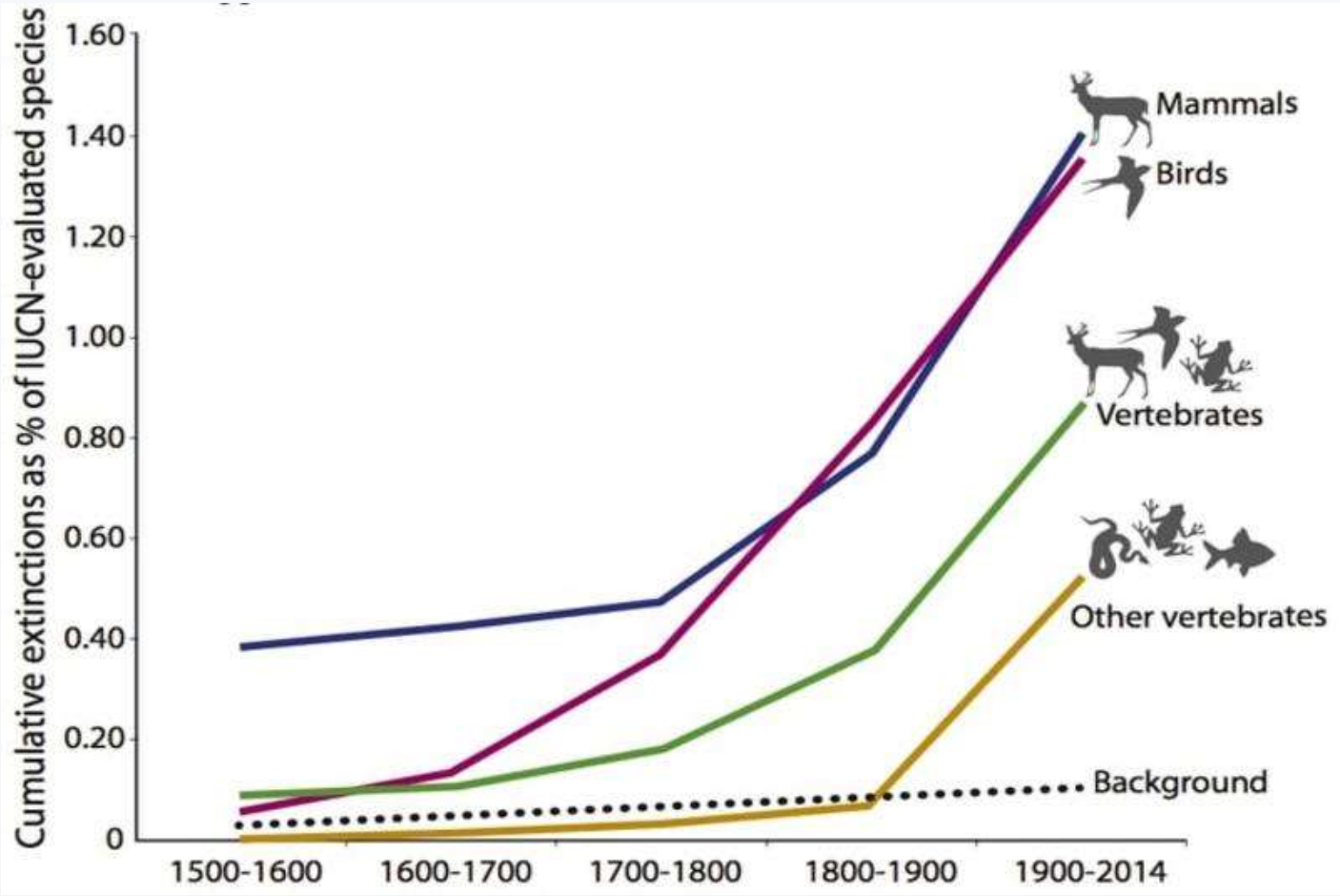
XII ISFP

Biodiversity crisis



Ceballos et al. (2015)

Biodiversity crisis

Bias towards vertebrates

→ Need for actions!

Conservation

Among possible conservation action:

- Breeding and reintroduction
- Relocation / Translocation

Gopher tortoise
(*Gopherus polyphemus*)

Black rhinoceros
(*Diceros bicornis*)

Californian condor
(*Gymnogyps californianus*)

Conservation

Commonly, (species-specific) parasites are intentionally removed during conservation actions targeting their hosts

Gophertortoise tick
(*Amblyomma tuberculatum*)

Gopher tortoise
(*Gopherus polyphemus*)

Amblyomma personatum
Dermacentor rhinocerinus

Black rhinoceros
(*Diceros bicornis*)

California condor louse
(*Colpocephalum californici*)

Californian condor
(*Gymnogyps californianus*)

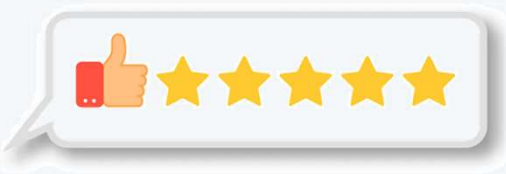
→ increases the extinction risk of parasites
→ conservation-induced extinction

Parasite extinction

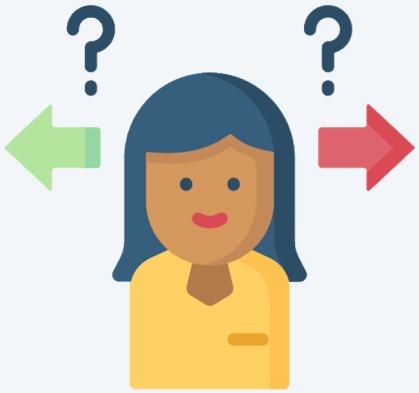
Extinction of parasite species is not good news!

Parasites

- Provide many ecosystem services
  linking food webs
  regulating host populations
  reducing impact of toxic pollutants
  …
- Have an intrinsic value
  Are part of genetic and species diversity
  Represent a (large) portion of evolutionary history



Dilemma of conserving parasites



Protect endangered free-living species at the risk of causing parasite decline/extinction?

OR

Protect endangered parasite species at the risk of decreasing host fitness?

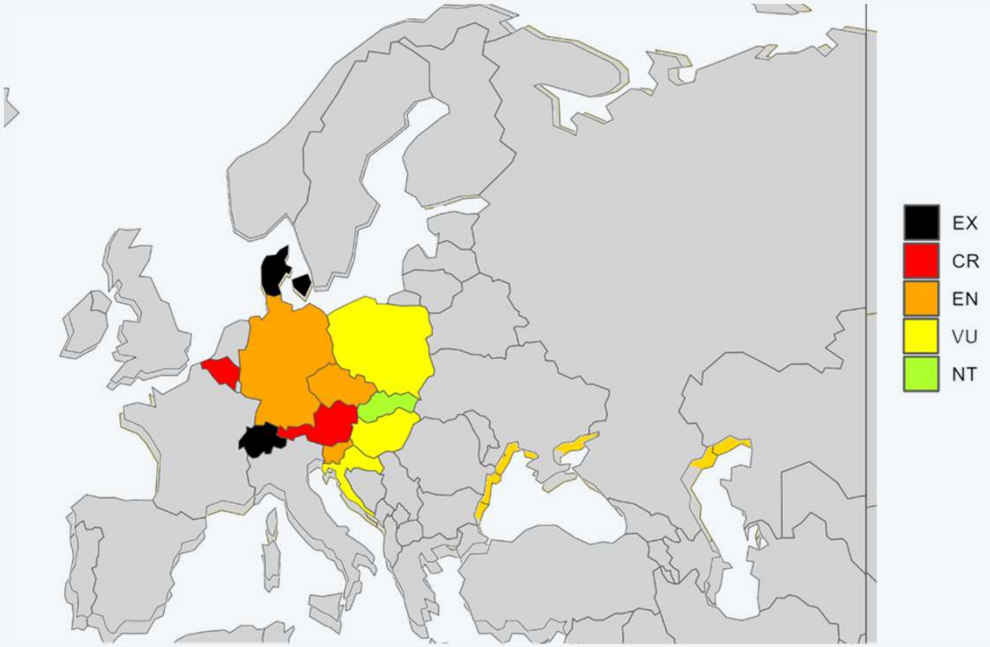
Conservation of one species should NOT hamper the conservation of other species!

→ We have a case study showcasing this

European weatherfish

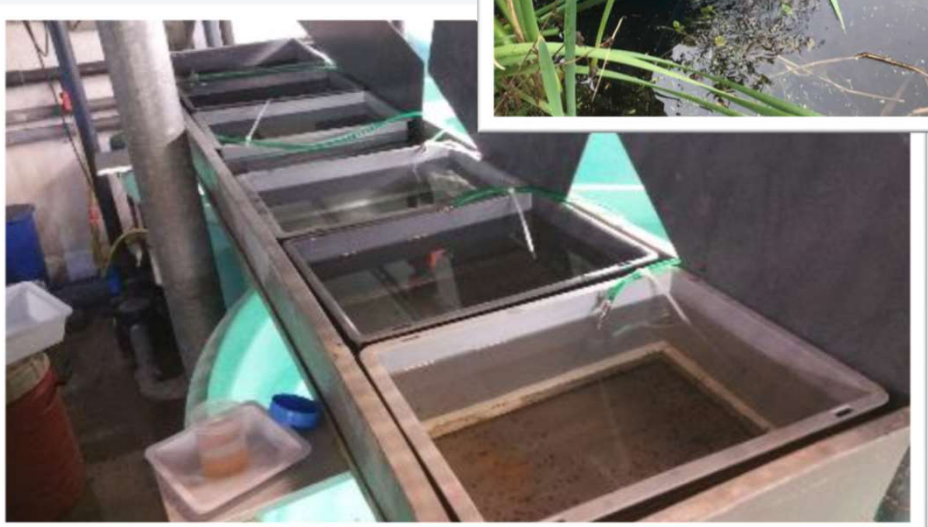
European weatherfish (*Misgurnus fossilis*)

Decreased in large parts of its native range
(habitat loss, pollution, invasion of 2 Asian congeners)



European weatherfish

Belgium: critically endangered (few small populations left)
Since 2021: protection plan in Flanders



Ex-situ breeding

- to restock existing Flemish populations
- to establish new ones in suitable habitats

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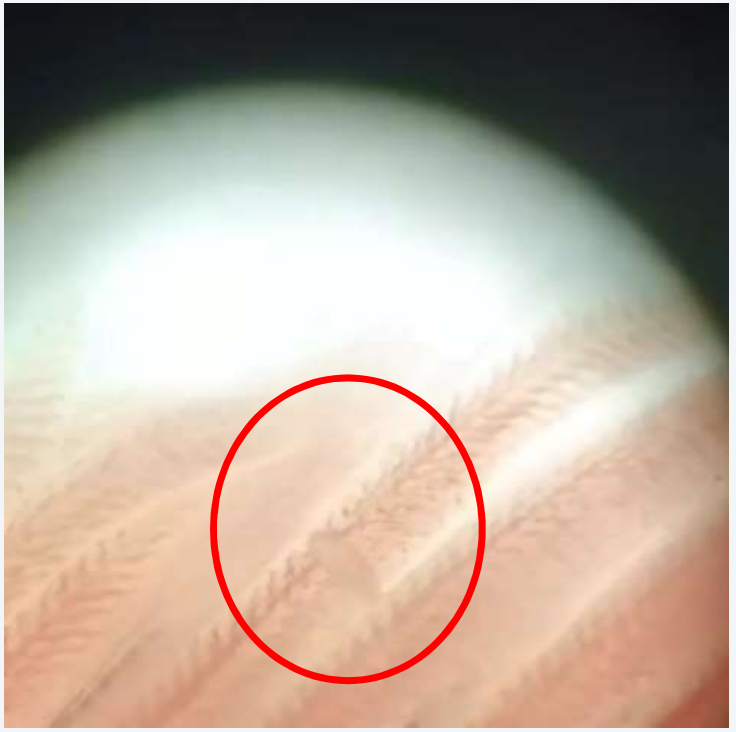
Vlaanderen is wetenschap

Parasites of the European weatherfish

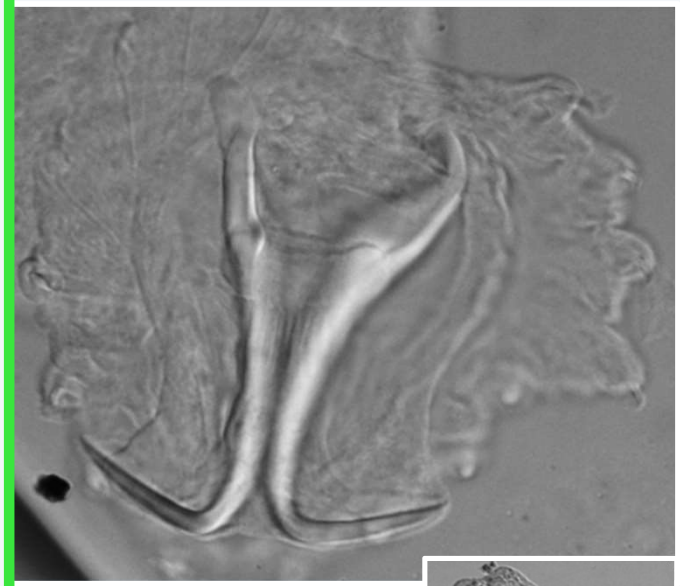
What about their parasites?

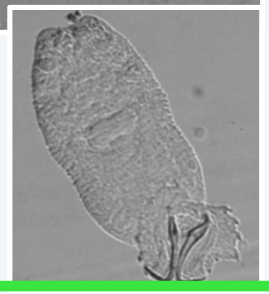
18 fish from 2024 (9 adults + 9 juveniles)
9 fish from 1881-1973 (9 adults)



Parasites of the European weatherfish

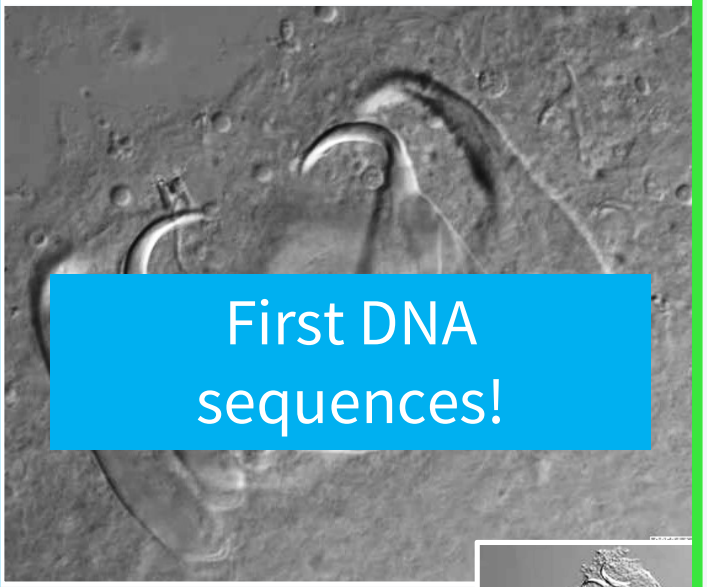
Gyrodactylus misgurni
(Gyrodactylidea)





Historical collection (& 1 recent specimen)

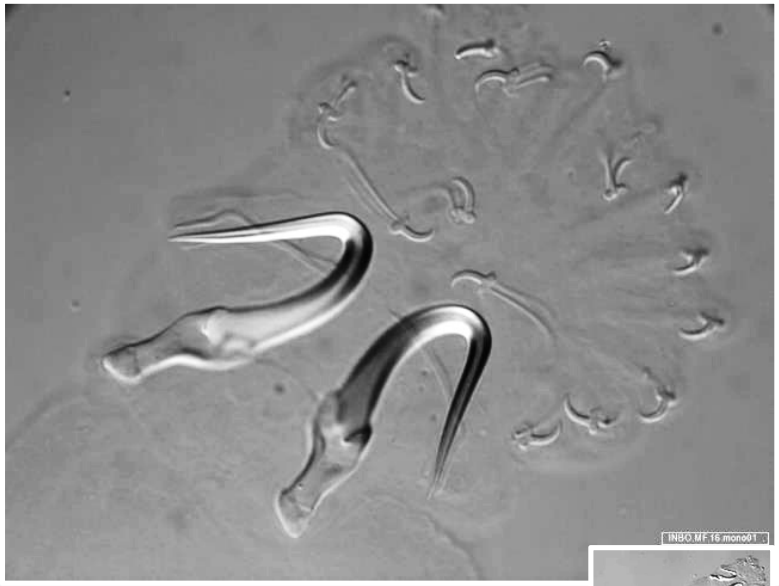
Actinocleidus cruciatus
(Dactylogyridea)



First DNA sequences!

Historical & recent collection

Gyrodactylus fossilis
(Gyrodactylidea)



Recent collection

Parasites of the European weatherfish

Extinction risk in Czech Republic & Slovakia

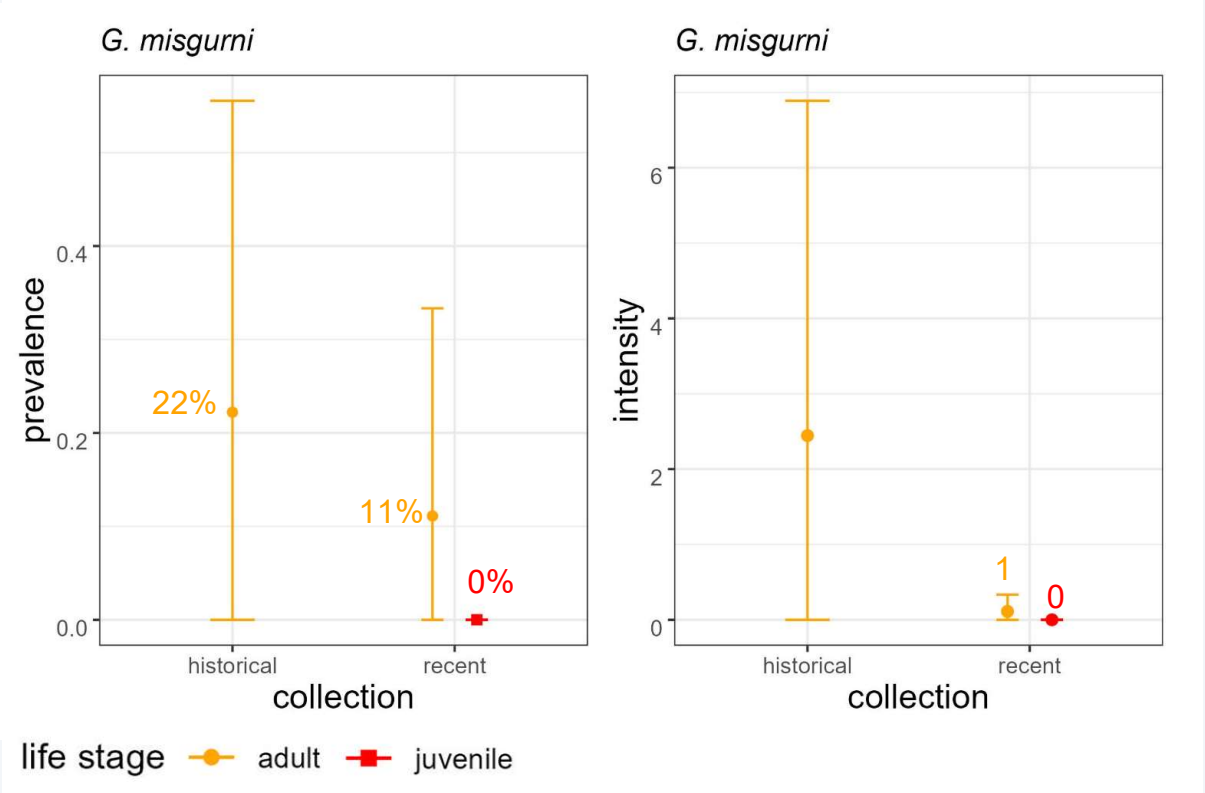
Baruš et al., 1997

HELMINTH CLASS/IUCN CATEGORY Helminth species	Host species	River basin[1]	Proposed IUCN category for Czech / Slovak Rep.[2]
MONOGENEA/CRITICAL			
Ancyrocephalus cruciatus (Wedl, 1857)	*M. fossilis*	E. O. D	EN / CR
Dactylogyrus chondrostomi Malevitskaja, 1941[3]	*C. nasus*	D	CR / SU
Dactylogyrus dirigerus Gusev, 1966	*C. nasus*	D	CR / SU
Dactylogyrus ergensi Molnár, 1964	*C. nasus*	D	CR / SU
Dactylogyrus nybelini Markevitch, 1933[3]	*C. nasus*	D	CR / SU
Dactylogyrus simplicimalleata Bychowsky, 1961[3]	*P. cultratus*	D	CR / VU
Gyrodactylus fossilis Lupu et Roman, 1956	*M. fossilis*	E. O. D	EN / CR
Gyrodactylus macrocornis Ergens, 1963	*C. nasus*	D	CR / SU
Gyrodactylus misguni, Ling Mo-en 1962	*M. fossilis*	D	helminth not recorded / CR
Gyrodactylus paraminimus Ergens, 1966	*C. nasus*	D	CR / SU
Paradiplozoon vojteki (Pejčoch, 1968)	*P. cultratus*	D	CR / VU

CR
Critically Endangered

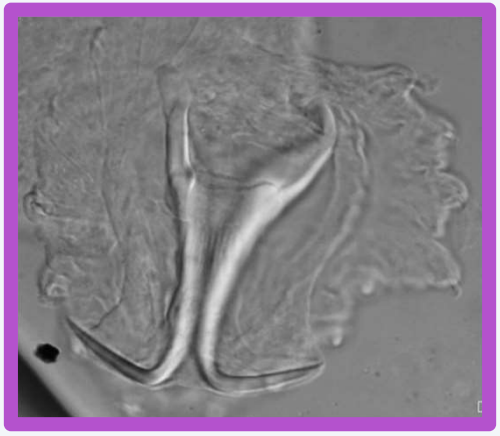
EN
Endangered

Parasites of the European weatherfish

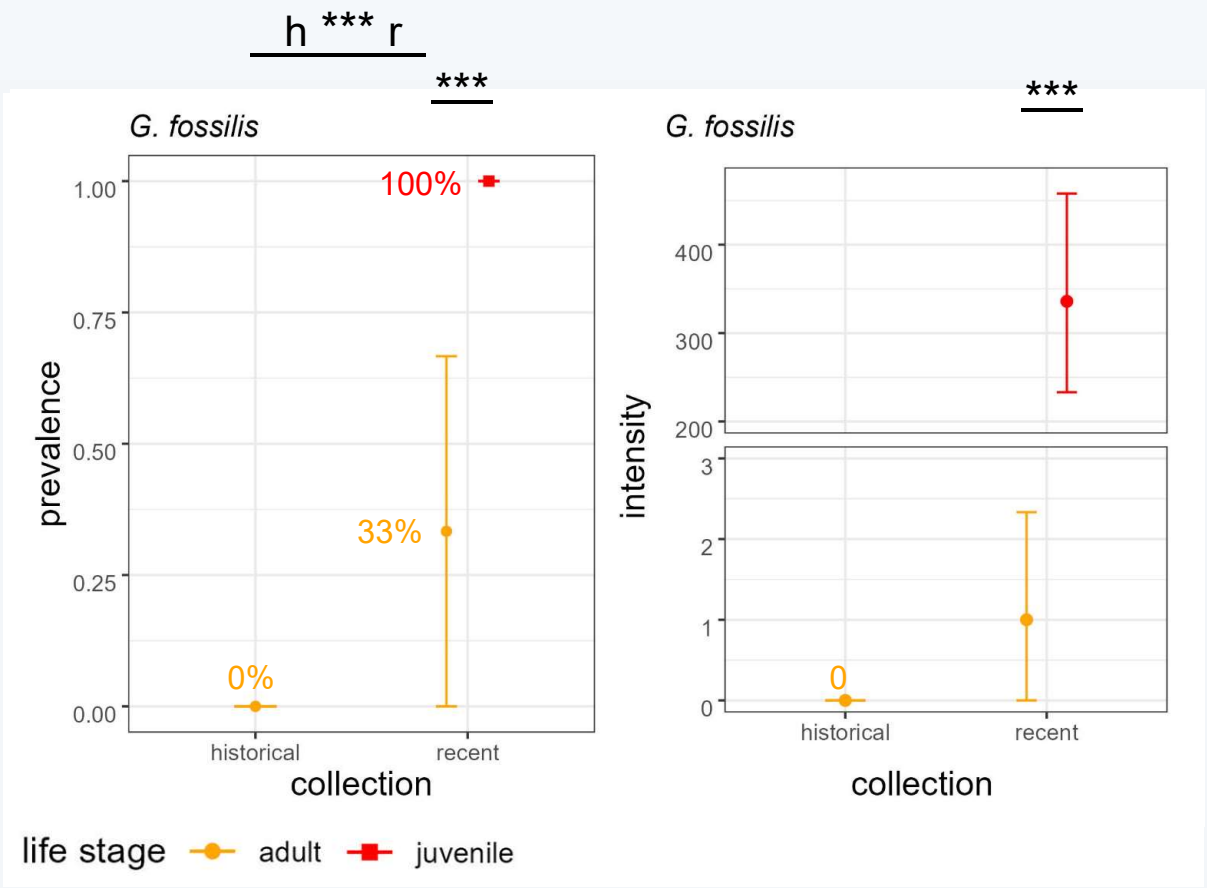


G. misgurni

On historical (adult) host specimens, except 1 individual on a recent fish *(no stats)*



Parasites of the European weatherfish



G. fossilis

Only on recent host specimens

All juveniles were infected and by much higher numbers than adults (mean 336 vs 1)

→ It may not have been present in Belgium in the past

→ Juvenile/adult difference in infection may be explained by their different diet

Parasites of the European weatherfish

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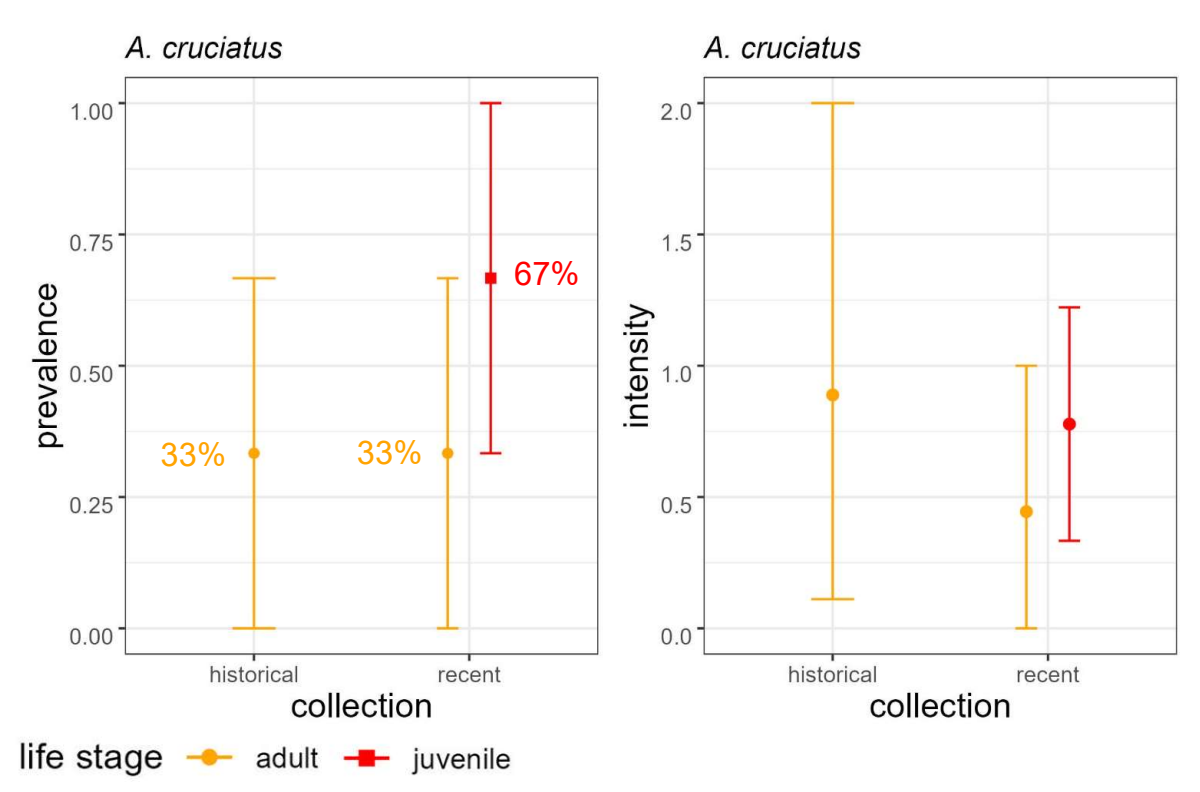
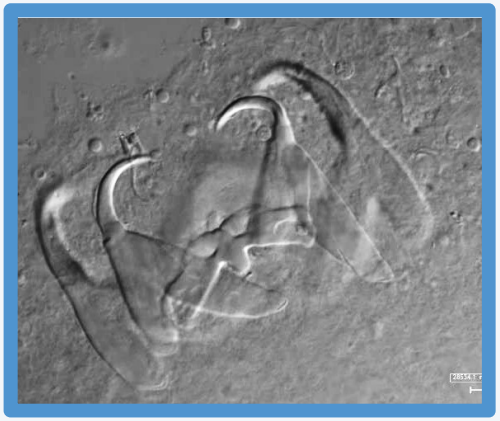


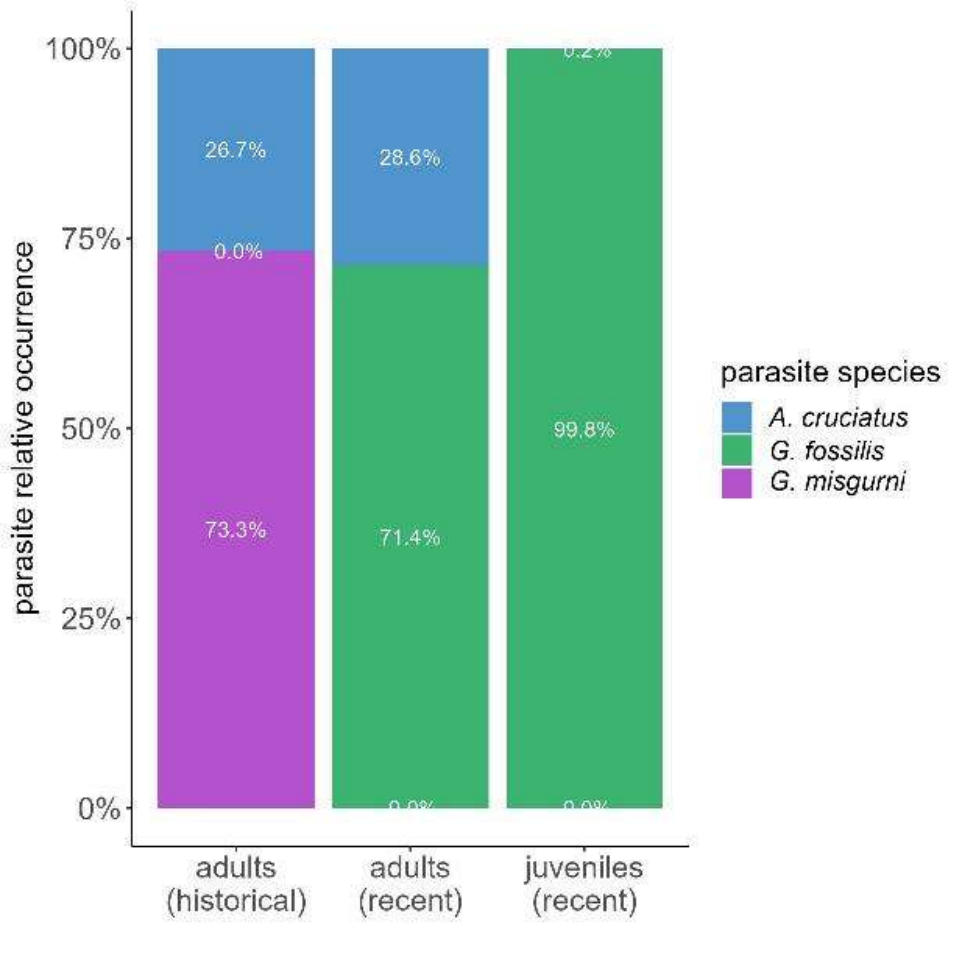
A. cruciatus

Despite similar prevalence, recent specimens had higher numbers than historical ones.

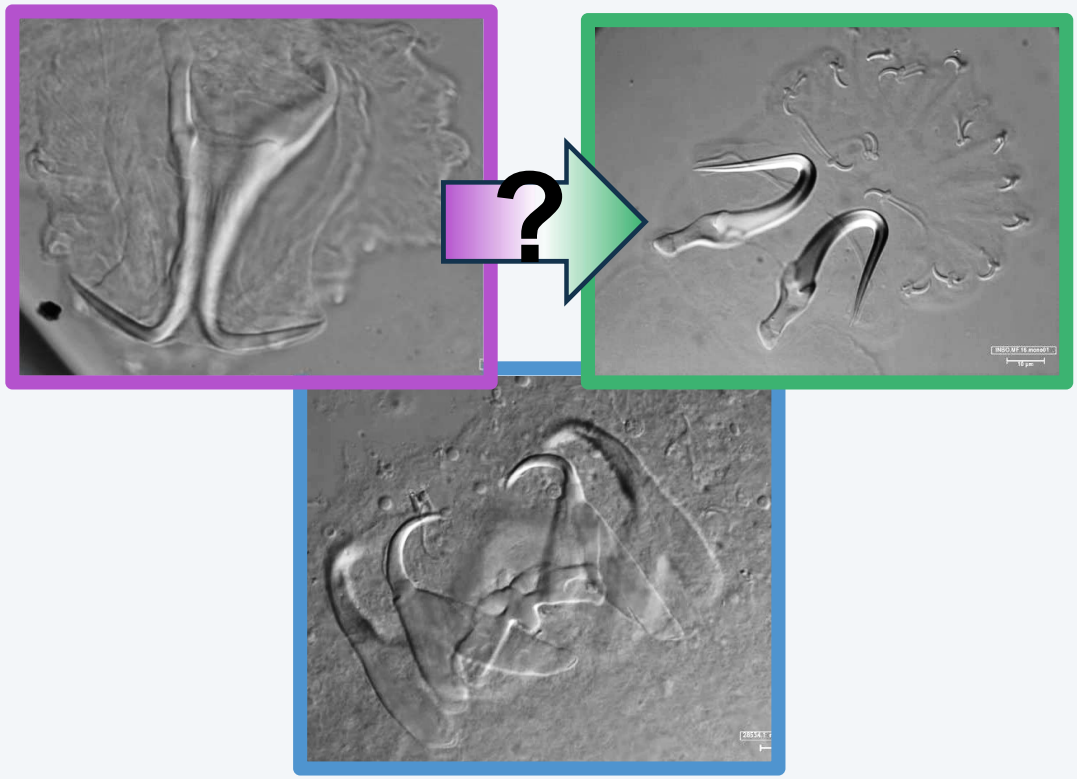
→ it thrives in aquaculture



Parasites of the European weatherfish



Hypothesis: *G. fossilis* filled the vacant niche of *G. misgurni*



Molecular characterization

A. cruciatus

18S-ITS1: 3 haplotypes

28S: 3 haplotypes

COI: 2 haplotypes

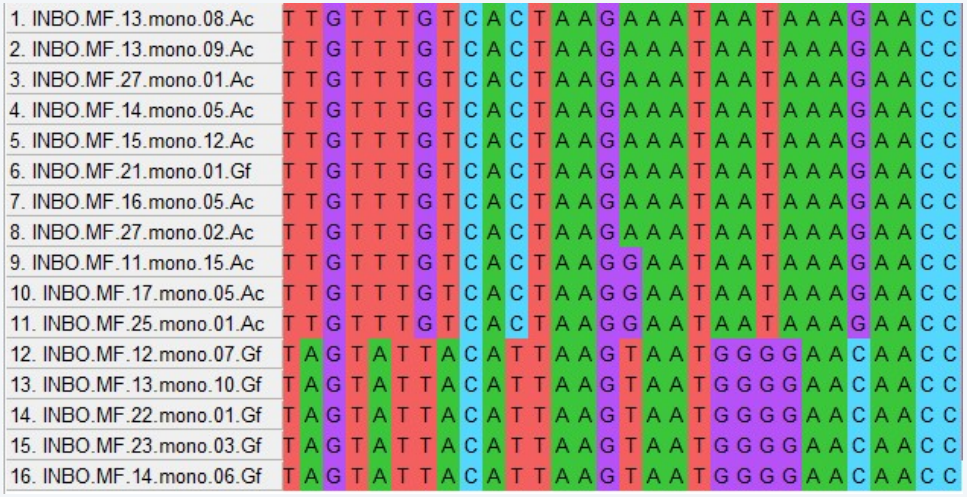
G. fossilis

ITS1: 4 haplotypes

28S: 3 haplotypes

COI: 3 haplotypes

Good resource for barcoding and eDNA detection



Winning pair

Normally, under moderate abundance, monogeneans do not kill their hosts

→ not necessary to actively remove them during conservation actions

Without parasite removal, conservation actions for hosts can benefit parasites, too!

→ Integrate parasitological assessments into conservation good practices

Thank you

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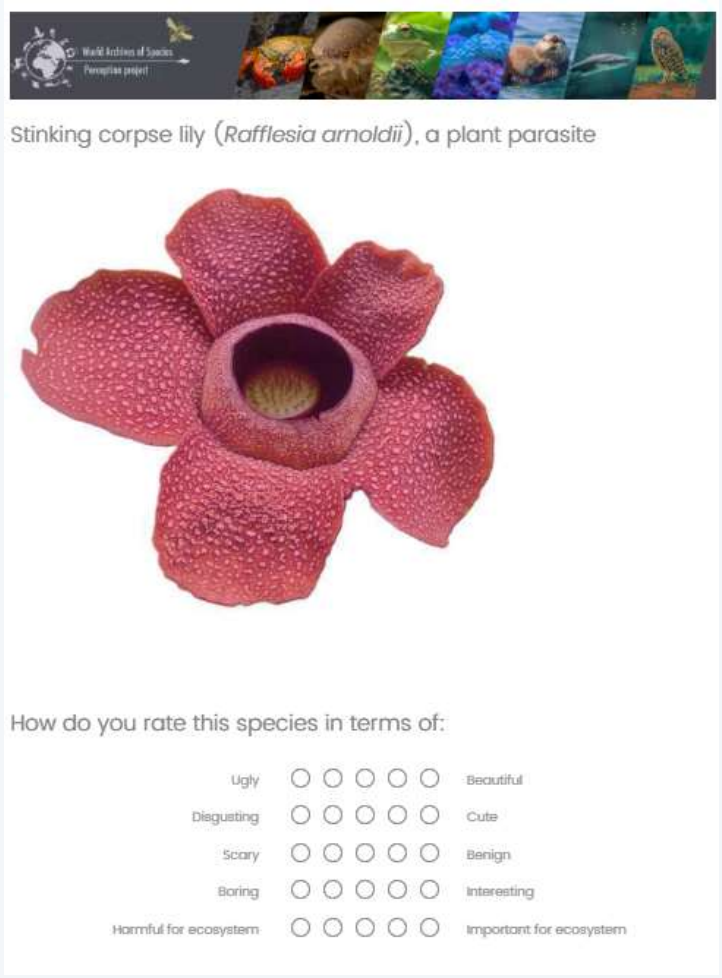
WASP-Parasite

World Archives of Species Perception, spin-off on parasites

https://tinyurl.com/wasp-parasite



Conservation

Most conservation programs are ignoring parasite

Iberian lynx (*Lynx pardinus*)
From “critically endangered” (2002)
to “vulnerable” (2023)

Iberian lynx louse (*Felicola isidoroi*)
From “unkown” (2002)
to “never seen again” (2023)